



User's manual

NeXT v1.0.2 (2023-03-24)

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1 Introduction

Thank you for buying ARCHON – system for intelligent control of compressor/blower/vacuum pump stations. ARCHON system is fully modular and that is why there can be parts of this manual which do not refer to your specific installation.

Following labels are used in the text:

Warning

Instructions labeled as Warning must be followed. Otherwise it can cause damage to the installed device or user's health.

Important

This section contains instructions vital for proper functioning of the device. If not followed damage to the device may occur.

Note

Notes contain various additional information.

Example

Practical examples contain hints and best practices for different situations.

1.1 Changelog

Brief description of changes introduced in version 1.6:

- NeXT version – new generation of 7inch graphical panels
- new version of integrated webserver

2 Storage and installation

2.1 Storage of the system

ARCHON system does not require any specific treatment during long term storage but respect the working temperature stated in technical parameters section and store the system in low humidity and low dust environment.

Long term storage probably erases settings of the system and that is why the settings should be renewed after the reconnection.

2.2 Installation of the system

ARCHON system is not designed to be installed by customers. Installation must be performed by a qualified electrician trained by the manufacturer.

Warning

The controller must be installed by a qualified electrician.

Before the installation check the controller specification (esp. power supply) and completeness of the delivery.

Warning

The controller is designed for various voltages and its connection to the wrong power source can cause permanent damage to the machine.

During the installation strictly separate high voltage devices and those which generate high EMC interference from all electronics. The system must be installed in well ventilated environment. Lower working temperature to prolongate life span of the device.

Do not place signal cables (RS485, digital inputs/outputs, sensor cables) along power cables.

Important

Electrostatic discharge can cause permanent damage to the machine. Pay attention to correct earthing when connecting the machine.

The controller must be installed directly to the wall vertically. Use all mounting points to install the controller. After mounting the machine to the wall connect all inlet and outlet clamps according to the attached diagram. The power supply can be turned on only when the door of the machine is secured. After switching the machine on it is necessary to set the system according to the instructions in Chapter 4.

 **Warning**

When changing any internal connections (to the machines, to sensors or to optional devices), it is necessary to switch the controller off and disconnect from the power source. The power supply can be reconnect after the switchboard door are closed.

3 System control

The control system initializes automatically after switching on. Home page containing basic parameters of the compressor station and each connected compressor is launched. Return to the home page by pressing *F1* button.

Advanced version home page is shown in *figure 3.1* for NeXT version and in figure

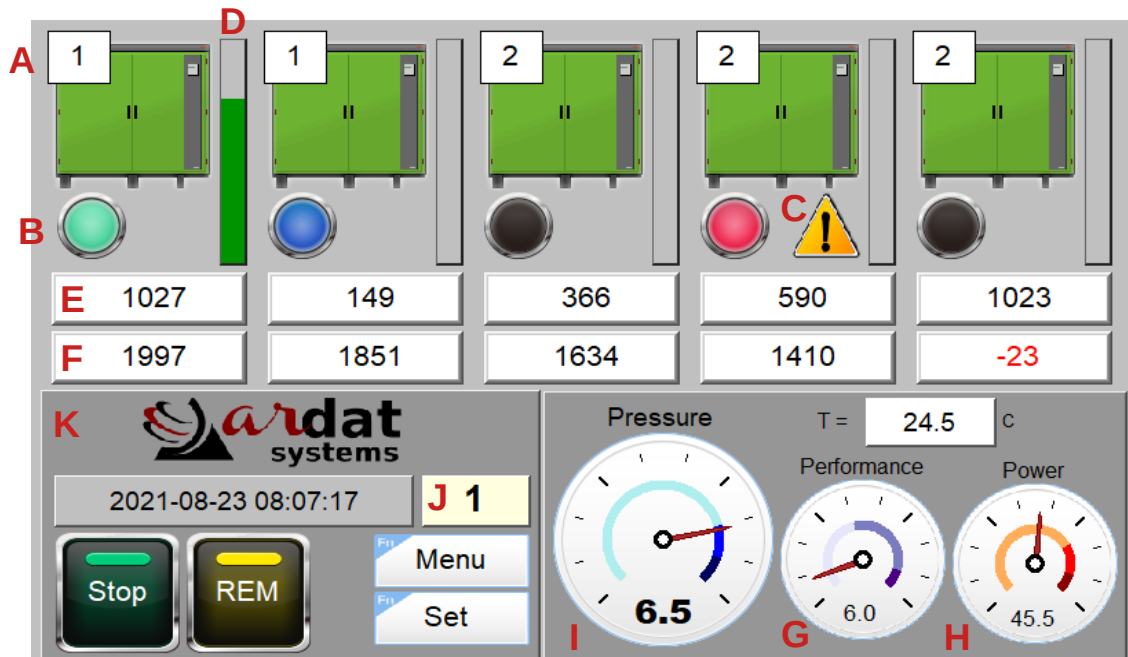


Fig. 3.1 ARCHON NeXT home page

The home page shows following data:

- A compressor priority,
- B compressor status indicator,
- C compressor error indicator,
- D compressor load,
- E compressor running hours,
- F service hours.
- G performance,
- H power,
- I pressure (color bar indicates the pressure limits),
- J current schedule,
- K control panel.

Compressor status indicator shows several compressor states (Advanced only):

- white – compressor ready,
- blue – compressor unloaded,
- green – compressor loaded,
- red – compressor error/not present.

Compressor load indicator is placed right of each compressor icon. The load is calculated as loaded time to unloaded/idling time in the given time frame (the time frame can be set in the system settings). If the current load exceeds the limit given to the particular compressor, the indicator will change color to red and the compressor priority is set to low until the minimum load is reached. This function ensures the optimal compressor load and cooling.

Example

If the time frame is 60 minutes and maximal load of compressor A is 75 percent, the compressor priority is set to low for 15 minutes after 45 minutes of full load.

If flow and/or power sensors are not installed, their values are computed from nominal parameters of compressors/pressure system. The FAD is computed from system volume, pressure difference and compressors performance.

3.1 Basic control instructions

Basic diagram of the NeXT controller is shown in fig. 3.2. The screens can be changed by touching the MENU button and choosing the screen.



The control system is switched on by pressing the Start/Stop button. When the control is switched on, ARCHON takes over the compressor control (even if the remote control is disabled) and starts/stops the machines according to the priorities and selected schedule. When the control is switched off, the compressors are shut down (if the compressors need some blow down time, they are shut down after the blow down delay).



Remote control is enabled/disabled by pressing the yellow REM/LOC button. If the system is set to automatic remote control (REM), the compressors are controlled exclusively by the ARCHON controller and shut down, if the controller is switched off. In open local control (LOC), the compressors will be switched to local control once the ARCHON controller is stopped and they will be controlled by their independent pressure sensors.

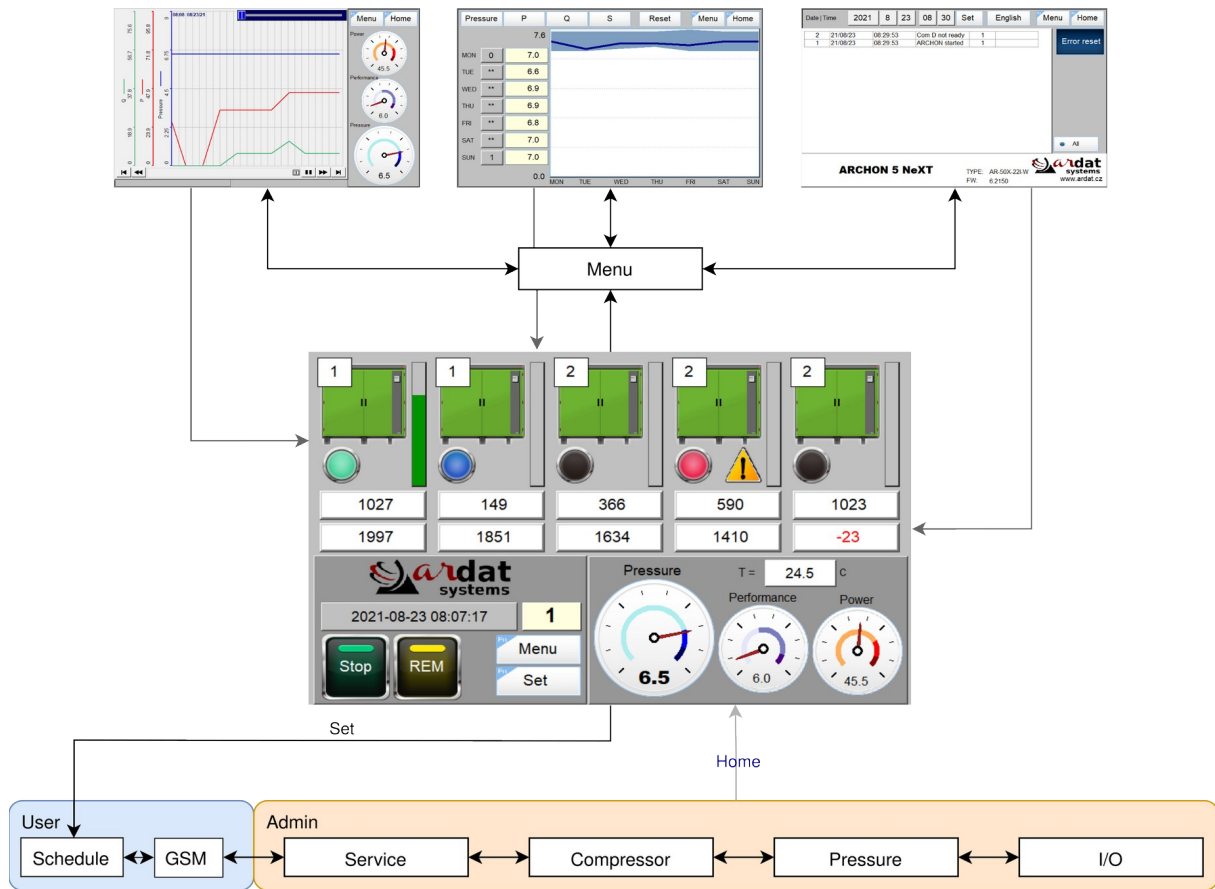


Fig. 3.2: ARCHON NeXT control diagram

3.2 User section description

3.2.1 History

This screen shows the pressure, energy consumption and station performance charts. The history shows last several hours and it is automatically redrawn. You can set the time interval and move the cursor to the past to see the full history.

3.2.2 Statistics

Screen 3 shows the week statistics. Minimal, average and maximal values of each variable (pressure, power, performance, temperature or user sensor) can be displayed for each day. You can select the variable in the upper left corner and see the date and average value in the left table. The chart shows the average value and the range from minimum to maximum. *Reset* button can be used to erase the statistics of the given date.

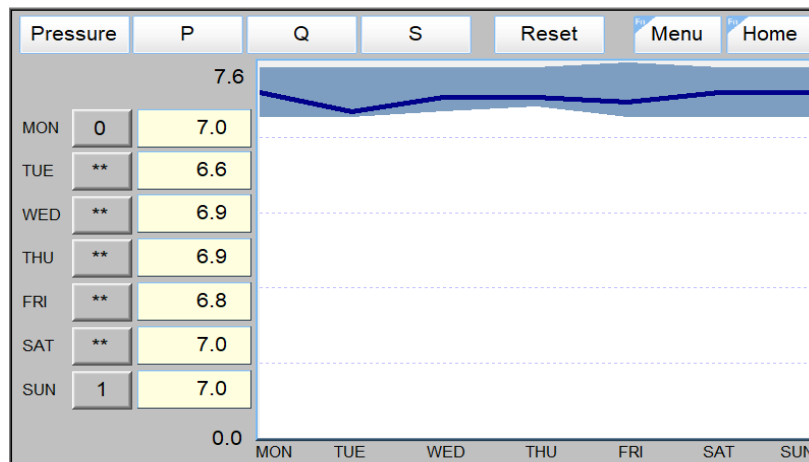


Fig. 3.3: Screen 3 – weekly statistics

3.2.3 Compressor monitoring (optional)

This screen shows all the details about the compressors. If the compressor is equipped with remote monitoring and this system is connected to the ARCHON controller (via RS485 or RS232 option), the data are shown here.

3.2.4 Q-SMART overview (optional)

Q-SMART contains details about the smart control. The controller is periodically re-calculating the current media consumption and the machines efficiency. This screen shows the four most effective combinations of compressors suitable for the given consumption as well as power, performance and specific power for each combination.

3.2.5 System log and user settings

Last user screen contains the event log and user settings. You can change the language by pressing the language button and set the system time.

Error reset button can be used to reset compressor errors (only for compressors without error output). The event log contains:

- number of event,
- date and time of the event,
- brief summary of the event/warning,
- number of occurrences,
- date and time of the event disposal.

The lower part of the screen shows the basic information about the software version, controller configuration and system supplier (contact to the authorized service, etc.).

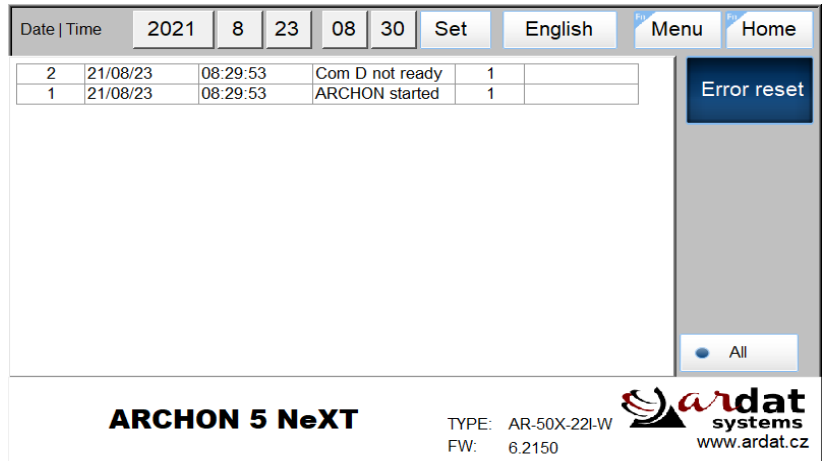


Fig. 3.4: User settings

4 System settings

System settings is accessible via special menu section. Press *Set* to enter the settings menu. You will need to enter following login details:

<i>user:</i>	admin	user
<i>password:</i>	9987	121

After the user name and password is correctly set, it is possible to enter the settings by touching the *Set* button once again. The menu contains following screens:

- schedule settings,
- service settings,
- compressor settings,
- pressure settings,
- sensors and IO settings.

Some settings are available only for administrator (esp. sensor settings, user accounts etc.). If higher access level is needed, you will be asked to enter the password again. Each part of the menu is described in the following paragraphs.

4.1 Schedule settings

ARCHON is able to work in several modes of compressor priorities settings. The proper priority settings reduces running and maintenance costs of the compressors by tens of percents. The optimal settings is application specific. It is recommended to combine several strategies and perform an energetic audit to maximize the advantage of each strategy.

Priority means the order of each compressor – the compressor with priority 1 will be started as first, the compressor with priority 2 will be started as 2nd, etc.

You can choose schedule 1 to 10 on the *schedule* screen. The settings of the selected schedule will be displayed bellow. Each time schedule contains

- *schedule type* – schedule can be truned on and off and *pressure settings* Px can be assigned to a schedule (see 4.3),
- *time of schedule activation* – time and day(s) of week, when the schedule should be activated, the schedule is active until next schedule is activated,
- *priority list* – first field represents the priority of compressor A, second compressor B, etc. input compressor number (1 for A, 2 for B, etc.) into each field, the compressors will receives priorities

from left to right, if 0 is written into the field, it is ignored (so some compressors can be completely turned off).

All changes will be performed once the given schedule is activated. If you want to force the schedule update immediately press UPD button; the current schedule settings will be applied.

4.1.1 Schedule off (OFF)

The schedule can be switched off. In such case, all other schedule settings will be ignored and next schedule will be activated.

Note

Switching off the schedule does not mean switching off the compressor station. To switch off the compressor station, follow paragraph 4.1.5.

4.1.2 Uniform load (MTH)

Once the schedule is activated, the compressors are sorted according to the priorities and service hours (MTH), so the compressors with the highest priority (lowest number) and higher MTH to service will start first and compressors with the lower priorities and lower MTH to service will start later. This leads to uniform load of the compressor station and synchronizes maintenance intervals for all compressors and thus reduces the service costs.

The priority list serves as enabled compressor list. If you want to disable some of the compressors, enter zeros into the list.

Note

If variable speed compressors are installed, it is usually preferred to set highest priority to these compressors, so they can be used for precise control from the beginning of the sequence.

4.1.3 Emergency compressors

If you want to start any of the compressors only in emergency state (when any of the standard compressors are in error state), you can use priority 51 and higher. Such compressor will start only if the other compressors are in error state or overloaded. It is possible to have more priorities for emergency compressors like 51 and 52 and the compressor with the lower number (higher priority) will start first.

4.1.4 Q-SMART

This settings will choose the compressors based on optimal energy efficiency of the whole compressor station and the given performance. The needed power for compressor idling is also calculated, which will prioritize the already running machines (so the controller will not stop the running machine if the theoretical energy savings are not covered by the idling costs). The algorithm will prioritize the compressors with higher prior-

ity/higher service MTH, if their specific power (efficiency) is the same. Otherwise, it will choose the most efficient compressor.

Important

Q-SMART should be activated only when the flow meter is installed. The performance estimation based on the pressure gradient is giving good results in average but cannot give immediate precise values for the compressor control. Using Q-SMART without the flow meter can lead to improper control strategy or unforeseen pressure losses.

4.1.5 Switching the compressor station off

If you need to switch off the compressor station completely at given time, use the fixed priority schedule and enter zero to all the priority fields.

4.2 Compressor setting

Choose a compressor from list – all the parameters will be updated. You can set following parameters of the compressor:

- *control type* – load/unload or variable speed drive (frequency inverter),
- *motohours* – service hours of the compressor, left field can be used for adjustment (if the compressors MTH are not even) and right field displayed the set value, >> button can be used to update the motohours,

Note

If the compressor bus is compatible with ARCHON, the MTH are directly read from the compressor controller. Otherwise, adjust the MTH to the compressor controller manually during the service check.

- *performance* – nominal FAD of the compressor, is used for FAD calculation,
- *power* – nominal power of the compressor, is used for power calculation,

Note

When not measured, performance and power are only indicative parameters. Variable speed compressors performance and power can not be estimated. If you need more precise data, ARCHON can be equipped with real power and FAD measurement.

4.3 Control settings

Control settings screen contains following parameters:

- *LOAD/UNLOAD pressure* – lower and upper pressure limit for starting/stopping the compressors (the pressure can be entered in *bar* or *psi*, however all units must be the same),
- *SET pressure* – target pressure for control, this value should be between LOAD and UNLOAD,
- *gain (P)* – gain of the PID regulator, this value limits the absolute pressure difference between set value and working pressure (ex. when $P = 100$ and pressure difference 1 bar, the response will be 100 %),
- *time constant (I)* – integration constant of the PID regulator, this values limits the absolute time, when the pressure can drop (ex. when $I = 4$ and pressure difference 0.1 bar, the response will reach 100 % after 2 minutes),
- *response (R)* – response threshold, when response meets this value, next compressor is started,
- *starting delay* – minimal delay between two compressor starts (default 10 s), this value is crucial for network overloading protection.

Default parameters are $P = 50$, $I = 2$ and $R = 100$. You can test the system behavior at: http://ardat.cz/archon/web/archon_pid.htm.

4.4 Sensor settings

Pressure sensor range can be set. For 4 – 20 mA sensor, the default settings will be -4.0 bar minimum and 16.0 bar maximum.

If the system contains flow-meter, it can be set here. Otherwise, parameter

- *receiver volume* – represents the volume of the receiver and connected system, this will be used for FAD calculation based on pressure drop/increase.

Two more parameters can be used for warnings.

Warning

If pressure exceeds the warning range, the system will consider this as an sensor failure and will stop compressor station from security reasons.

4.5 External control settings

Auxiliary input AUX0 can be configured as a remote control. If this settings is activated, LCD start command is ignored and compressor station can be started only via AUX0 signal.

5 Web interface

ARCHON system can be equipped by a web server for remote monitoring of the compressor station. Default address of the device is *192.168.0.1*. To connect to ARCHON system first set your web interface and then enter

http://192.168.0.1/awp/ARCHON

to your browser. Now you should see the opening screen of the web interface (see fig. 5.1). In the upper part of the screen there is a menu allowing you to change language setting and set hardware of the controller. For further information please read a user's guide of a Siemens controller. You can download the latest version of the user's guide on http://ardat.cz/archon/v1/SIMATIC_S7.pdf.

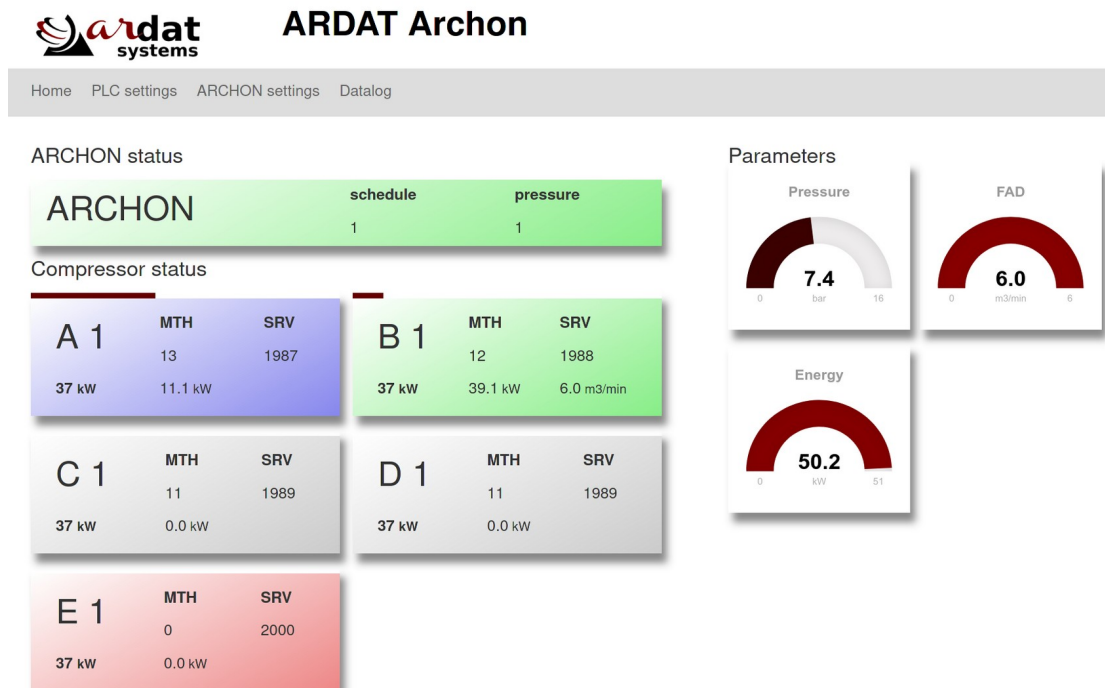


Fig. 5.1: ARCHON web interface

On the left you can see status (green – working, red – failure, grey – ready) and MTH of each compressor. On the right there is an information chart with system parameters (pressure, FAD, power).

5.1 Web address setting

Warning

The web address can only be changed by a qualified technician. An unqualified intervention can cause non-functioning of the system.

To change the web address, log into the system. After the login click on *Controller setting* and in the left upper part insert your name and password, then you can return to the main screen and choose *Web setting*. Enter the new IP address, subnetwork mask, tick system restart box and confirm *Save*.

 **Important**

After the IP address change the system will be restarted. The setting page will not be reloaded and you must insert the new IP address to the browser.

 **Warning**

Before restarting the system (IP address change) make sure all compressors are switched off. The control will be offline during the restart and the compressors may be started automatically.

After changing the IP address it is necessary to update the panel setting. Follow the instructions in the HMI panel user's guide.

 **Important**

In case of any doubts contact the service center. If you fail while changing the setting, it is possible that communication will not be established and the panel will not work.

6 MODBUS

The ARCHON can be supplied with MODBUS server as an option to communicate with remote system. The MODBUS server is available via TCP or RS485 (MODBUS/RTU). Server listens on port 502, the default device address is 1.

The registers are described in following table.

Registr	Délka [byte]	Rozsah	Popis
0	2 (R/W)	UINT	ARCHON control word (system on, remote on)
1	2 (R)	UINT	Compressor state – each bit represents ready signal of one compressor (MSB = compressor A), 1 = compressor ready, 0 = compressor not ready.
2	2 (R)	UINT	Compressor running – each bit represents running signal of one compressor (MSB = ARCHON ready, MSB-1 = compressor A), 1 = compressor running, 0 = compressor idle
3	2 (R)	UINT	Compressor error – each bit represents error signal of one compressor (MSB = ARCHON ready, MSB-1 = compressor A), 1 = compressor error, 0 = compressor OK
4	2 (R)	UINT	Working pressure in technical units, 1 TU represents 100 physical units.
5	2 (R)	UINT	FAD in technical units, 1 TU represents 100 physical units.
6	2 (R)	UINT	Power in measured units.
7	2 (R)	SINT	User sensor (temperature) in technical units
8-16	2 (R)	UINT	Compressor load (A, B...) in percents
17 - 34	4 (R)	ULONG	Compressors A, B... MTH
35 - 43	2 (R)	SINT	Compressor temperature
44 - 52	2 (R)	UINT	Compressor error code

7 Technical specification

7.1 Basic operation details

7.1.1 Control module

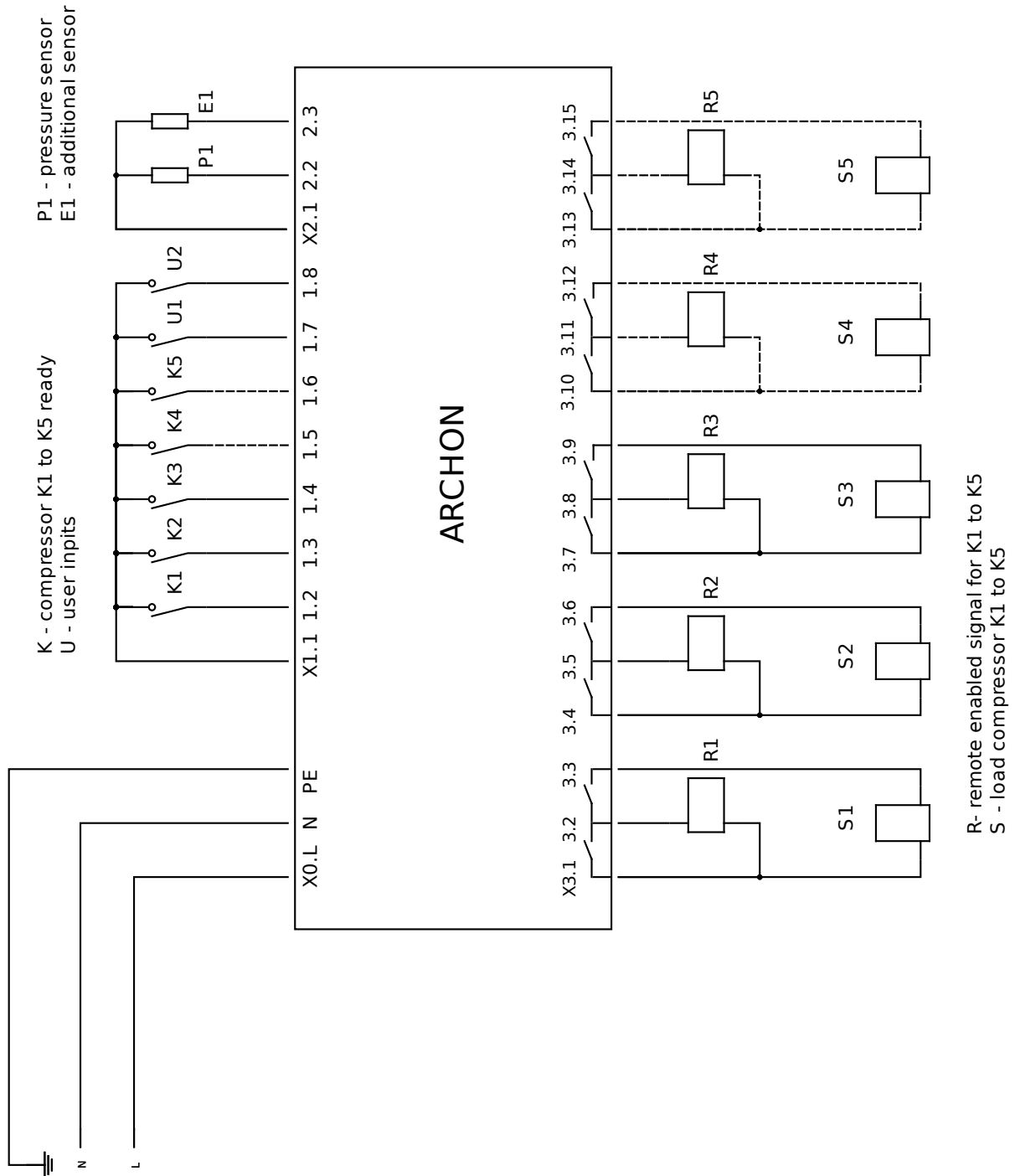
Version	v230	v24
Supply voltage	88 ~ 264 VAC	22,0 ~ 28,8 VDC
Frequency	47 ~ 63 Hz	–
Energy consumption (w/o LCD)	16 W	12 W
Operation temperature	-20 ~ 60 °C	

7.1.2 HMI

Version	NeXT
Supply voltage	19,2 ~ 28,8 VDC
Current – nominál / maximal	500 mA
Operation temperature	0 až 50 °C

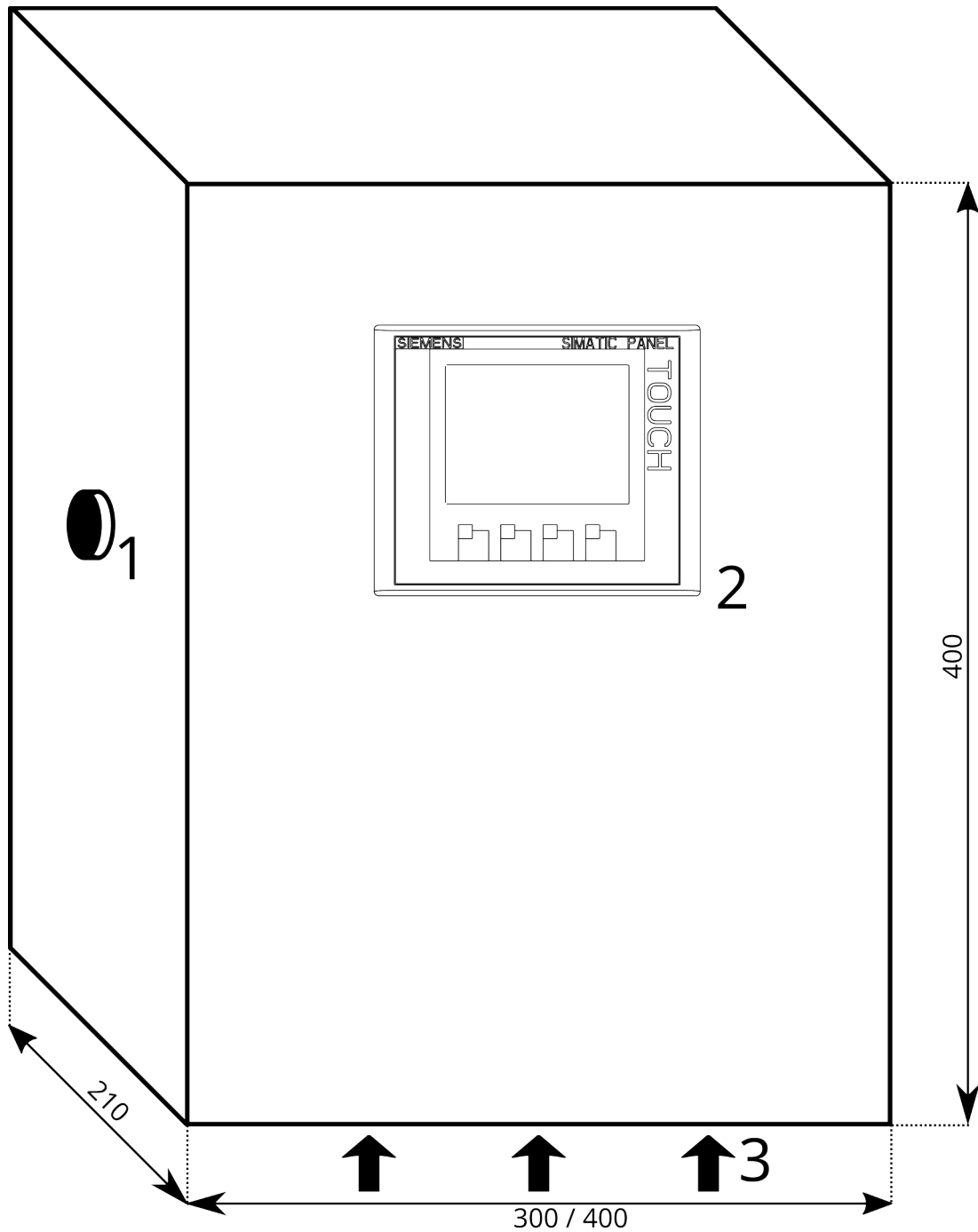
Consult controller and HMI handbook supplied together with the device for more details.

7.2 ARCHON 3/5 recommended wiring diagram



Note: Ports X3.10 to X3.15 and X1.5, X1.6, resp. are available only in ARCHON5.

7.3 ARCHON dimensions



Legend:

- 1 – main power switch
- 2 – control LCD
- 3 – input clamps

All dimensions in mm.

8 Firmware update

Firmware can be updated by SD card provided by the manufacturer. Update can result to change of configuration or some user functions. Contact the manufacturer for more details.

9 Technical requirements

You can use following table to specify a technical inquiry of the ARCHON control system. Please, check all required variants and options and/or attach notes to the „customer option“ column.

Parameters	option 1	option 2	option 3	other
Compressor count	3	5	9	
Frequency inverter driven compressors				
Supply voltage	230 VAC	24 VDC	110 VAC	
Analogov input AI0 (pressure)	0 ~ 10 V	0 ~ 20 mA	4 ~ 20 mA	
Analogov input AI1 (FAD / power)	0 ~ 10 V	0 ~ 20 mA	4 ~ 20 mA	
LCD				
• version	yes	ne		
• LCD position	basic	advanced	NeXT	
• color (Advanced only)	internal	external		
Power measurement	no	yes		
• Current and voltage of the entire compressor station				
Webserver	no	yes		
SD card logging	no	USB		
RS485 for remote monitoring	no	yes		
High ambient version (-40 °C)	no	yes		
Backup battery for long term shutdowns	no	yes		
Additional info				

Please, keep in mind that the controller without LCD has only limited capabilities and can not be set without additional accessories.